Lean Manufacturing & Environment: Opportunities for Environmental Improvement

EPA National Performance Track Program
Tele-Seminar #7
November 20, 2003

Tele-Seminar Agenda

- **Introduction to EPA's Activities Related to Lean Manufacturing** (Dave Dellarco, EPA National Center for Environmental Innovation)
- **Research Findings on Connection Between Advanced Manufacturing and Environment** (Tim Larson, Ross & Associates Env. Consulting)
- **Rockwell Collins Experience** (Vicki Fisher, Rockwell Collins)
- **Lockheed Martin Experience** (Dave Gunnarson, Lockheed Martin)
- **Q&A / Discussion**

EPA Lean & Environment Initiative

- **EPA initiated research to:**
  - Improve understanding of the relationship between lean and environmental performance and the regulatory framework;
  - Identify implications and opportunities for existing EPA regulatory and voluntary programs; and
  - Identify action opportunities for EPA and other environmental agencies.
- **Two research reports have resulted**
  (see www.epa.gov/innovation/lean.htm)
- **EPA Lean & Environment Steering Committee launched in June 2003**

What is Lean?

- Lean Manufacturing / Lean Production
- Six Sigma
- Agile Manufacturing
- Advanced Manufacturing
- World Class Manufacturing

What is Lean?

- Lean thinking and production aims to produce ***products and services with the highest quality at the lowest possible cost with maximum customer responsiveness.***
  - Reduce production resource requirements
  - Increase manufacturing velocity/flexibility
  - Improve first time quality
- Lean accomplishes this through the ***systemic identification and elimination of waste***, with an emphasis on ***continuous improvement and employee involvement***.

How does lean do this?

Lean seeks to eliminate manufacturing waste:

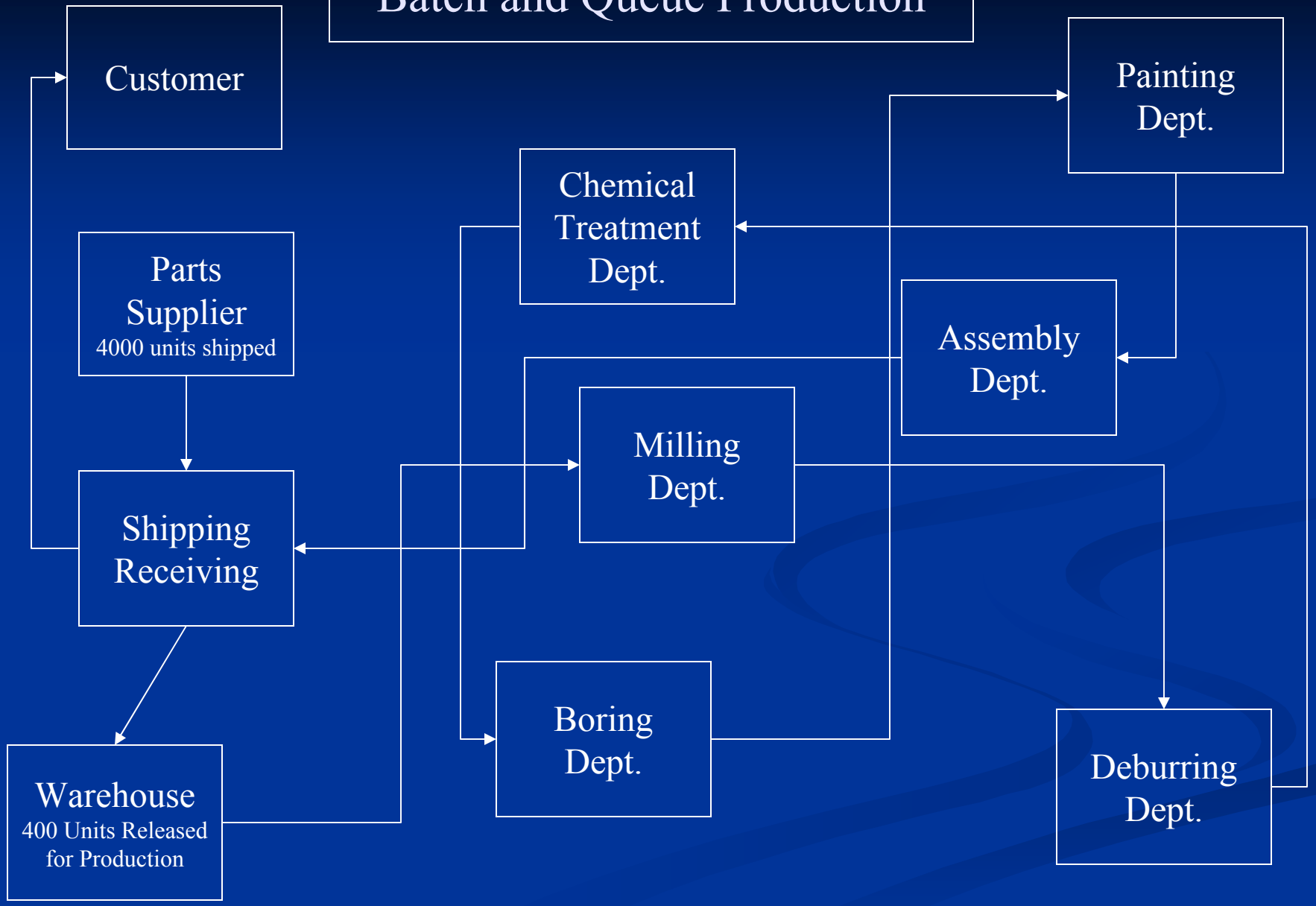
- Inventory
- Defects
- Overproduction
- Waiting
- Movement
- Complexity
- Unused employee creativity and suggestions

How does lean do this? Lean Methods

- 5S
- Standard Work and Visual Controls
- Total Productive Maintenance (TPM)
- Cellular Manufacturing
- Quick Changeover
- Just-In-Time (JIT) and Kanban

- Kaizen Rapid Improvement Process
- Production Preparation Process (3P)
- Lean Enterprise Supply Chain Networks
- Six Sigma

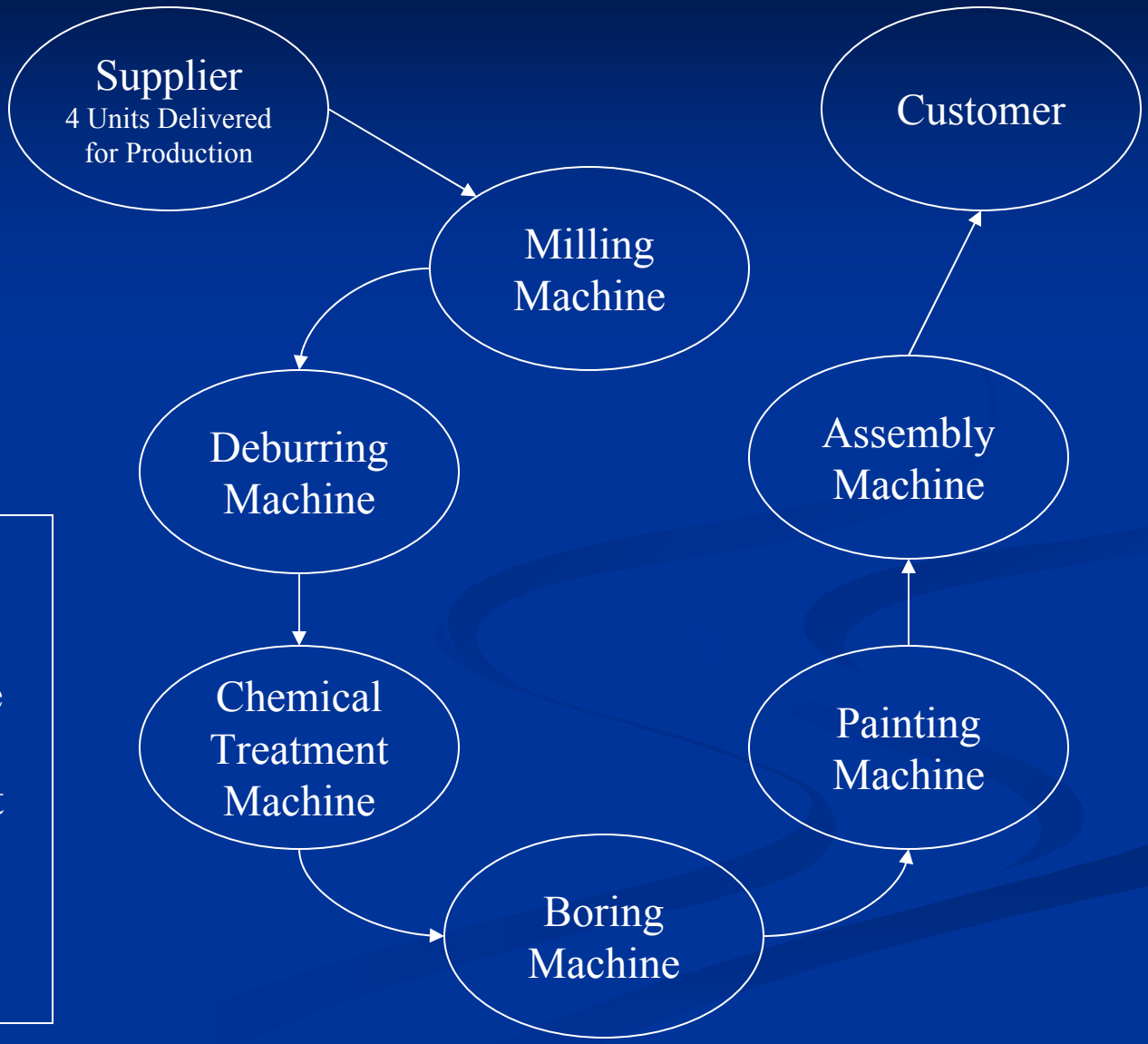
Batch and Queue Production



Lean Product-Aligned, Cellular, One-Piece Flow

"This is a factory not a warehouse!"

Culture Change
- Continual Improvement Waste Elimination Culture
- Metrics Driven
- Supply Chain Investment
- Operations-Based
- Employee Involvement
- Whole System View



Key Research Observation #1

Lean produces an operational and cultural environment highly conducive to waste minimization and P2.

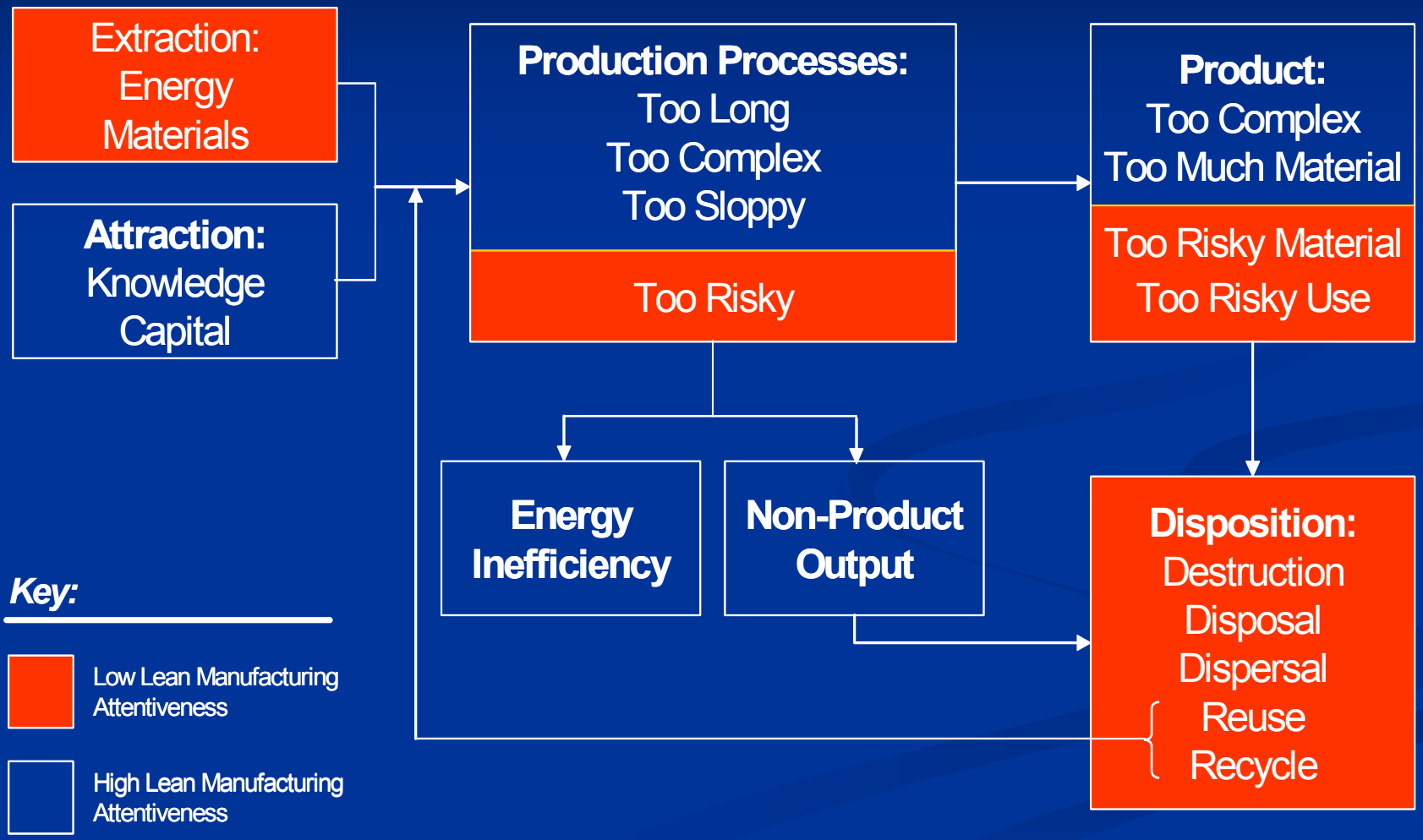
- **Resource productivity** improvements of 39%; chemicals from 9 to 3; new paint removal system (RAFB)
- Assembly **flow time** reduction of 35%, moving from 60+ days to "3-Day Car" (GM)
- Shift from large paint booth to multiple **right-sized** efficient paint systems (Goodrich)

Key Research Observation #2

Lean can be leveraged to produce even more environmental improvement, by addressing environmental "blind spots".

- California "green" furniture purchasing standards (Furniture Manufacturer)
- Hazardous waste *kaizen* rapid improvement event (Goodrich)
- Revising lean methods and training manuals (Simpler Consulting)

Lean "Blind Spots": Risk and Lifecycle Impacts



Key Research Observation #3

Lean can result in some regulatory friction around environmentally-sensitive processes.

- "Kaizen" rapid improvement event to reconfigure 100,000 square feet plant in 1 week (Goodrich)
- Chemical point of use system and RCRA satellite waste accumulation requirements (RAFB)

Implications for EPA and State Environmental Agencies

- Ride coattails of lean trends
- Address lean's environmental "blind spots" (risk, lifecycle impacts) to leverage greater environmental improvements
- Remove environmental regulatory "friction points" associated with lean implementation through guidance and innovation
- Explore opportunities to apply lean methods to improve agency processes and systems

EPA's Plan for Action

Action Area #1:	Ride lean coattails & work with partners to address "blind spots" and leverage maximum environmental benefits from lean
Action Area #2:	Harmonize air permitting with lean operating environment & mobile, right-sized equipment
Action Area #3:	Clarify acceptable compliance & P2 strategies for lean chemical management under RCRA
Action Area #4:	Conduct research on other topics (e.g., EMS-lean relationship)

EPA Lean & Environment Initiative

- See www.epa.gov/innovation/lean.htm for more information on EPA's activities in this area
- EPA is interested to learn from and work with companies engaged in integrating environmental management with advanced manufacturing
- Contact Dave Dellarco at EPA at (206) 553-4978 or dellarco.dave@epa.gov to learn more